## Space Weather Forecast

Issued on Saturday, 15 July 2023 at 13:05 Local

**This forecast provides a four day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales**

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**Space Weather Forecast Headline: Minor/Moderate R1/R2 Blackouts likely throughout. Chance of G2/Moderate Storms Day 1, 3 & 4 (15, 17 & 18 July).**

**Analysis of Space Weather Activity over past 24 hours**

**Solar Activity:** Solar activity has been Moderate over the past 24 hours, with several M-class flares originating from a region in the southwest quadrant. The largest was a short-duration M2.9 flare observed at 15/0741 UTC. These produced a couple of Coronal Mass Ejections (CME) which have been analysed but for which the results are still pending.

A filament (arc of plasma suspended above the sun's corona) was also observed lifting off the sun during the evening UTC hours. The eruption is visible on satellite imagery, showing an asymmetric halo. The eruption looks faint, however it is likely to be Earth-directed with an arrival at Earth during the early UTC hours of the 17th (Day 3). Confidence is very low though, due to a lack of imagery during that period.

There are currently up the seven sunspot regions on the visible disc. The two most interesting regions on the disc are both large and have sufficient magnetic flux to generate a strong flare.

**Solar Wind / Geomagnetic Activity:** The solar wind was indicative of two CME arrivals. The wind speed jumped from 380 to 440km/s at 14/1525UTC and then from 370 to 500km/s at 15/1030UTC. The Interplanetary Magnetic Field was weak to moderate but became enhanced as the 1st CME arrived, peaking at strong levels. It is now back to moderate levels. The north-south component was largely weak and mostly northward directed, except between 14/1600-1800UTC and 15/0840-1020UTC where it became moderately southward directed.

Geomagnetic activity was mostly Unsettled to Active with a G1/Minor Storm interval 14/1800-2100 UTC during the first half of the period, but largely Quiet during the second.

**Energetic Particles / Solar Radiation:** No solar radiation storms were observed.

**Four-Day Space Weather Forecast Summary**

**Solar Activity:** Moderate activity is likely, with a slight chance of Strong flares. These are most likely from the two largest regions on the disc - one in the southwest and the other in the northeast.

**Solar Wind / Geomagnetic Activity:** Earth is currently experiencing weak CME effects. A couple of Earth CMEs are probable although the result of the analysis are still pending. However if these were to be confirmed, they could give either arrive at Earth or give a glancing blow on the 17th and/or 18th (Day 3 and Day 4). Confidence is low. Little coronal hole influence is expected during this period.

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Geomagnetic activity is therefore expected to be predominantly Unsettled to Active through Day 1, Day 3 and Day 4, with an increased chance of G2/Moderate Storm intervals on Day 3 and Day 4 (17th & 18th), due to the CMEs mentioned above. Day 2 is mostly likely to be Quiet.

**Energetic Particles / Solar Radiation:** No solar radiation storms are expected, but there is a slight chance of reaching the S1/Minor Storm threshold through the period, should any larger X-ray flares occur.

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**Geomagnetic Storms:**

| Geo-Magnetic Storm Probability (Exceedance) | Level | Past 24 Hours (Yes/No) | Day 1 (00-24 UTC) (%) | Day 2 (00-24 UTC) (%) | Day 3 (00-24 UTC) (%) | Day 4 (00-24 UTC) (%) |
|---|---|---|---|---|---|---|
| Minor or Moderate | G1 to G2 | Yes | 30 | 1 | 40 | 20 |
| Strong | G3 | No | 10 | 1 | 20 | 5 |
| Severe | G4 | No | 1 | 1 | 1 | 1 |
| Extreme | G5 | No | 1 | 1 | 1 | 1 |

**Radio Blackouts - X Ray Flares:**

| X Ray Flares Probability | Level | Past 24 Hours (Yes/No) | Day 1 (00-24 UTC) (%) | Day 2 (00-24 UTC) (%) | Day 3 (00-24 UTC) (%) | Day 4 (00-24 UTC) (%) |
|---|---|---|---|---|---|---|
| Active | R1-R2 M Class | Yes | 60 | 60 | 60 | 60 |
| Very Active | R3 to R5 X | No | 10 | 10 | 10 | 10 |

**Solar Radiation Storms - (High Energy Protons):**

| Radiation Storms Probability (Exceedance) | Level ($cm^{-2}$ $sr^{-1}$ $s^{-1}$) | Past 24 Hours (Yes/No) | Day 1 (00-24 UTC) (%) | Day 2 (00-24 UTC) (%) | Day 3 (00-24 UTC) (%) | Day 4 (00-24 UTC) (%) |
|---|---|---|---|---|---|---|
| Active | ≥ S1 | No | 15 | 15 | 15 | 15 |
| Very Active | ≥ S3 * | No | 1 | 1 | 1 | 1 |

* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)

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